

Nov. 28, 1961

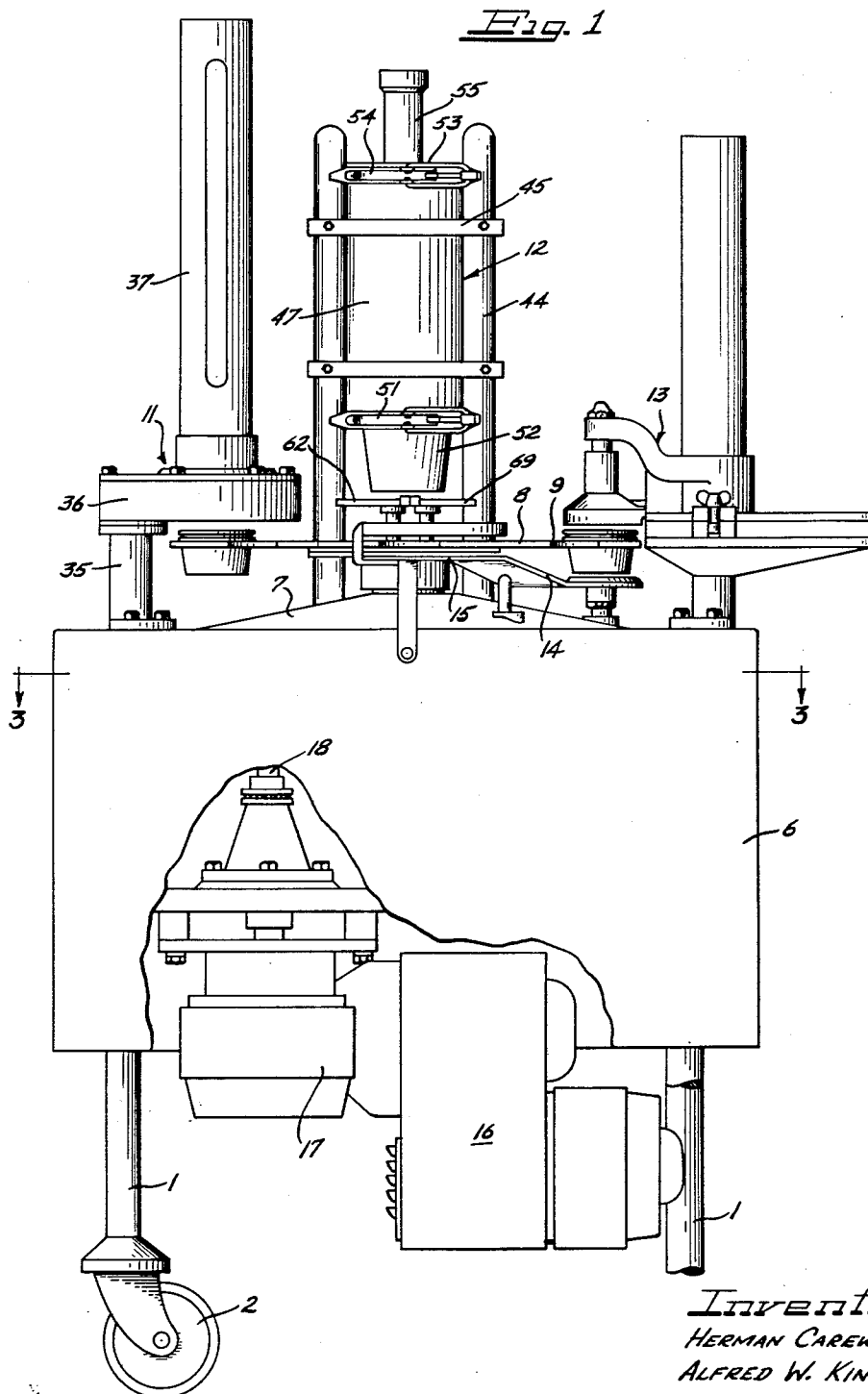
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3,010,263

FILLING MACHINE AND METHOD OF FILLING CONTAINERS

Filed Sept. 4, 1957

7 Sheets-Sheet 1



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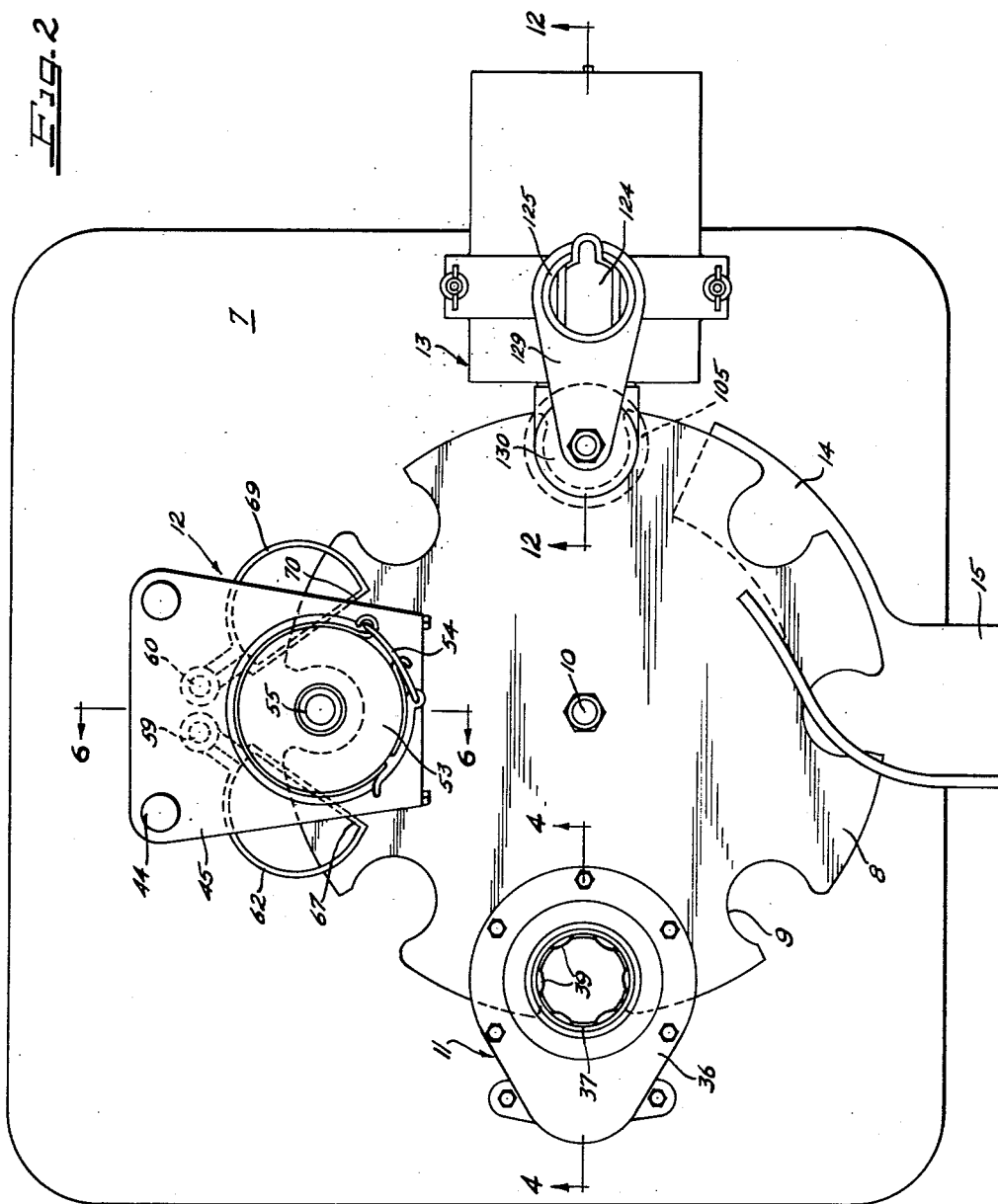
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FILLING MACHINE AND METHOD OF FILLING CONTAINERS

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Fig. 2



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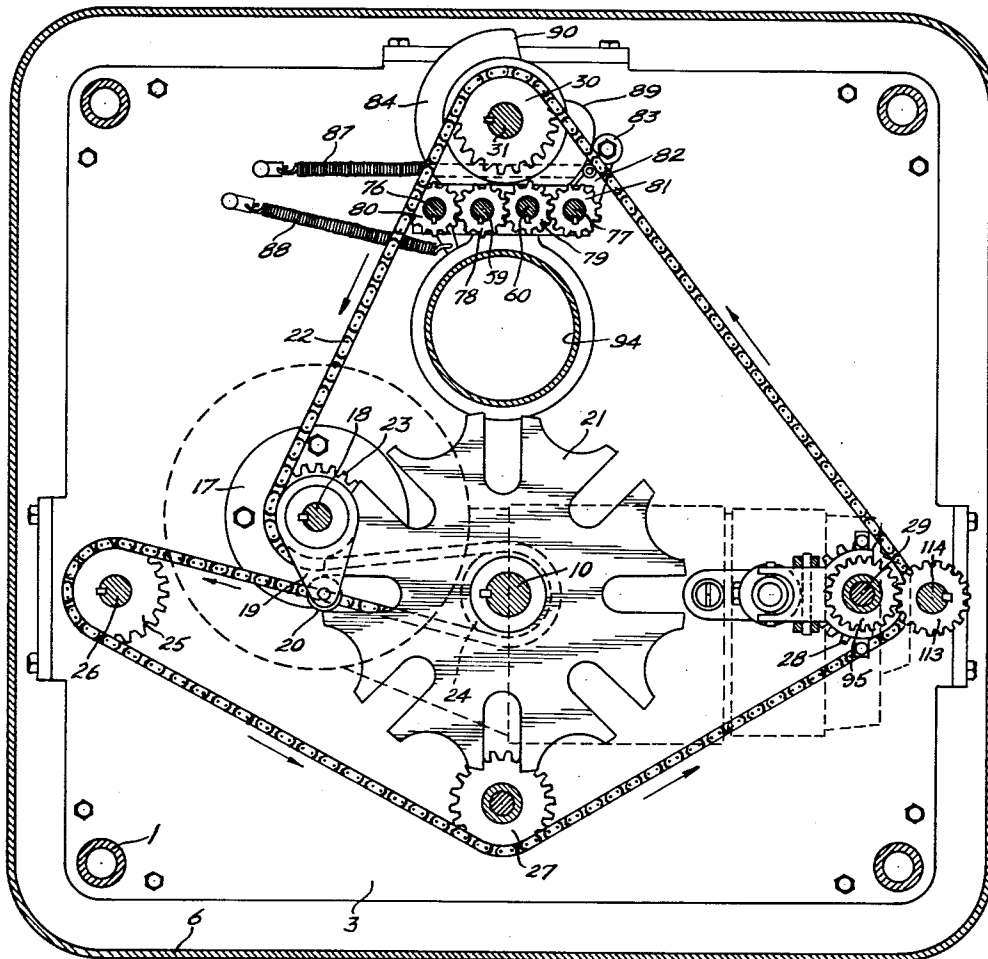


Fig. 3

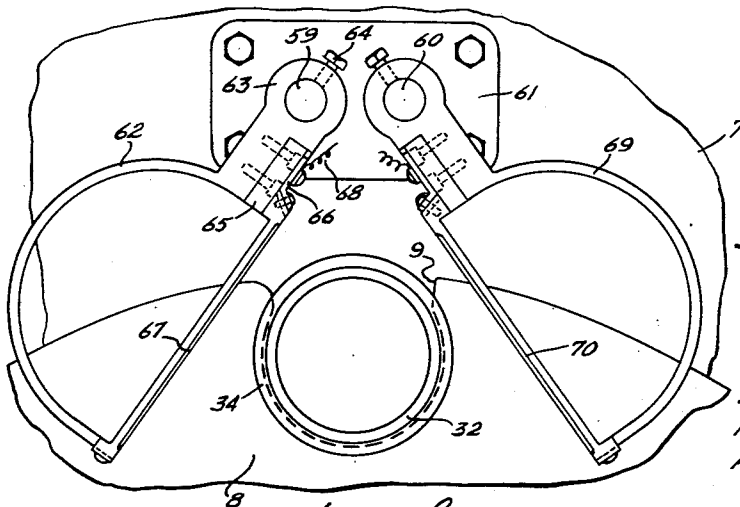


Fig. 8

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Fig. 4

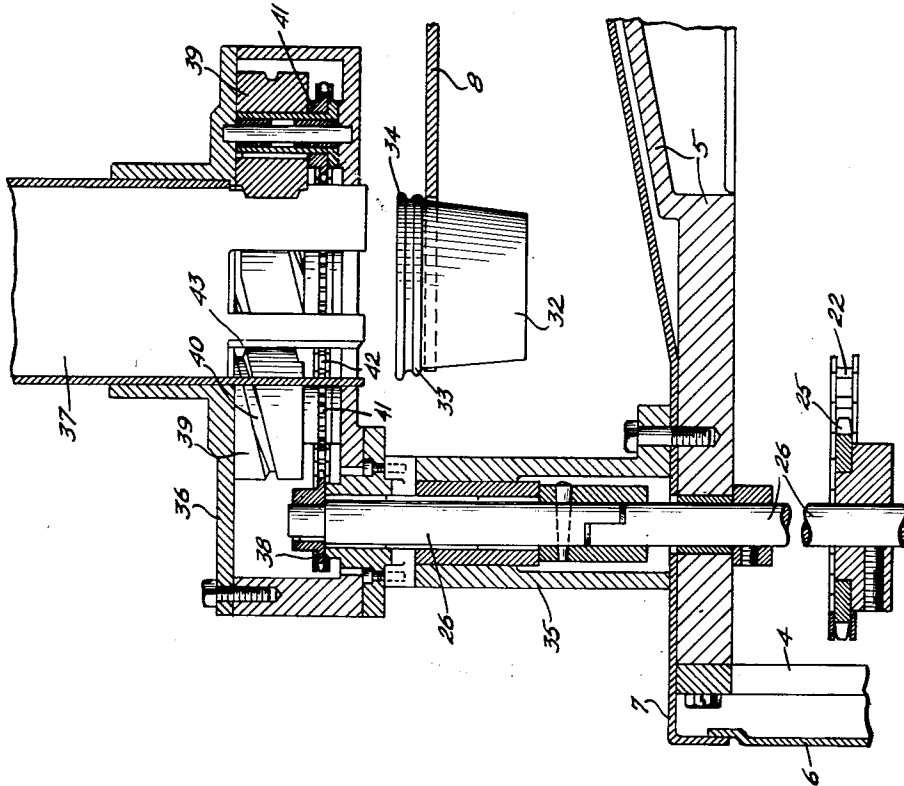
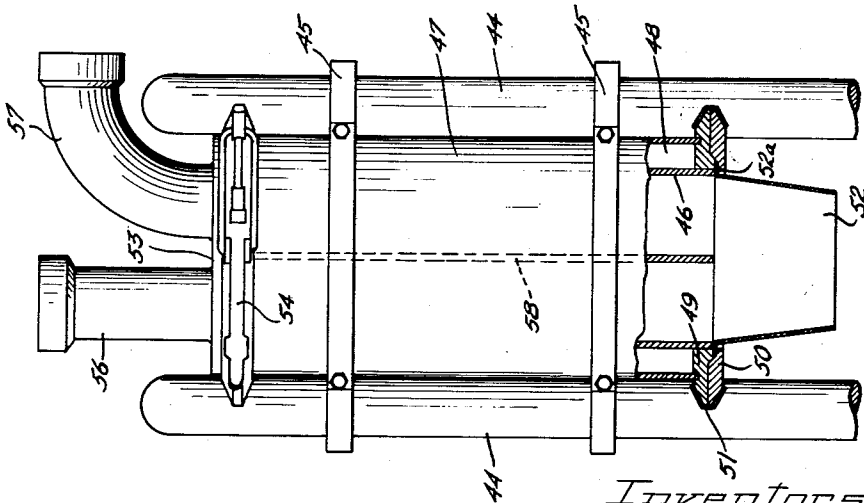


Fig. 5



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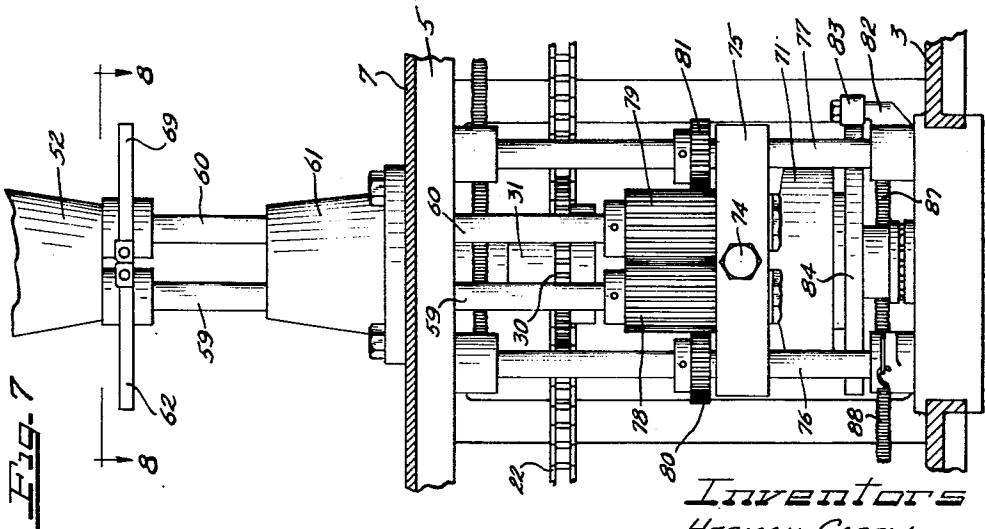
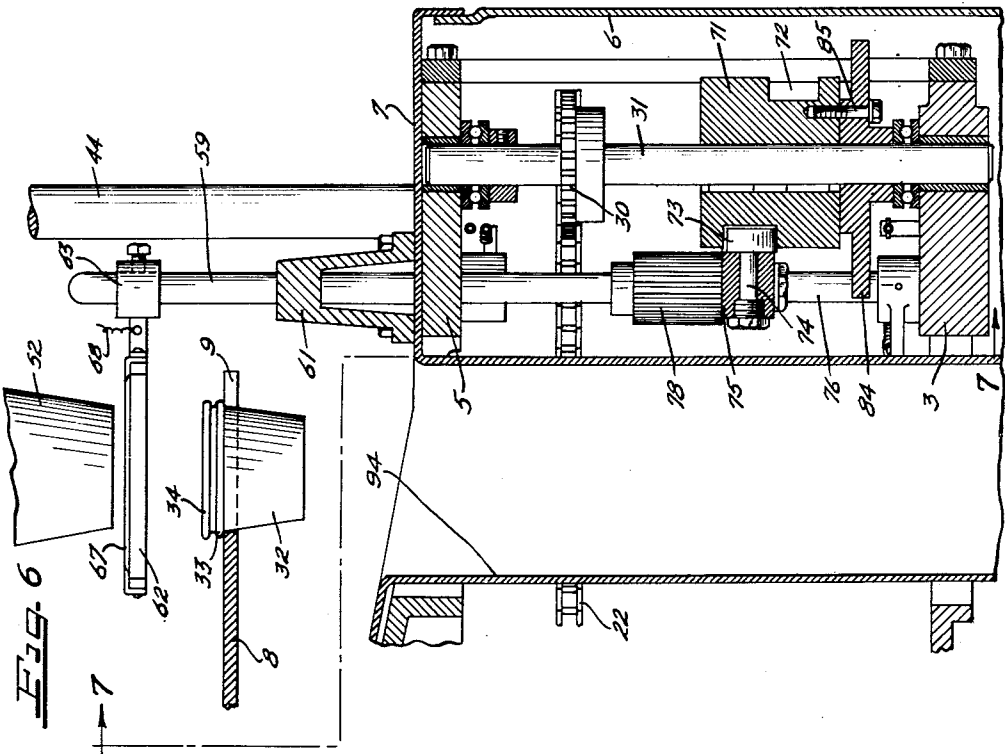
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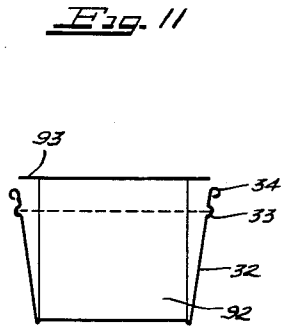
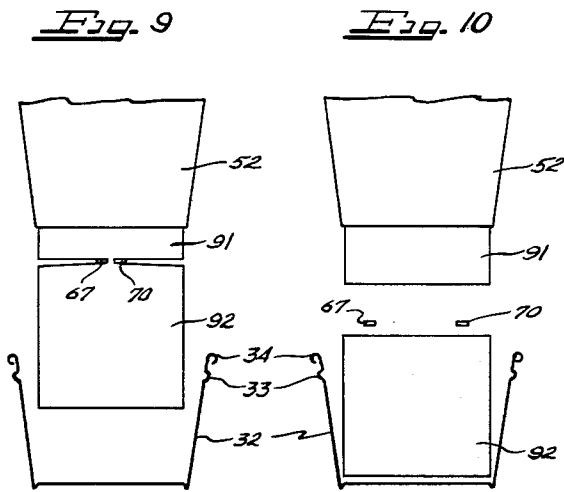
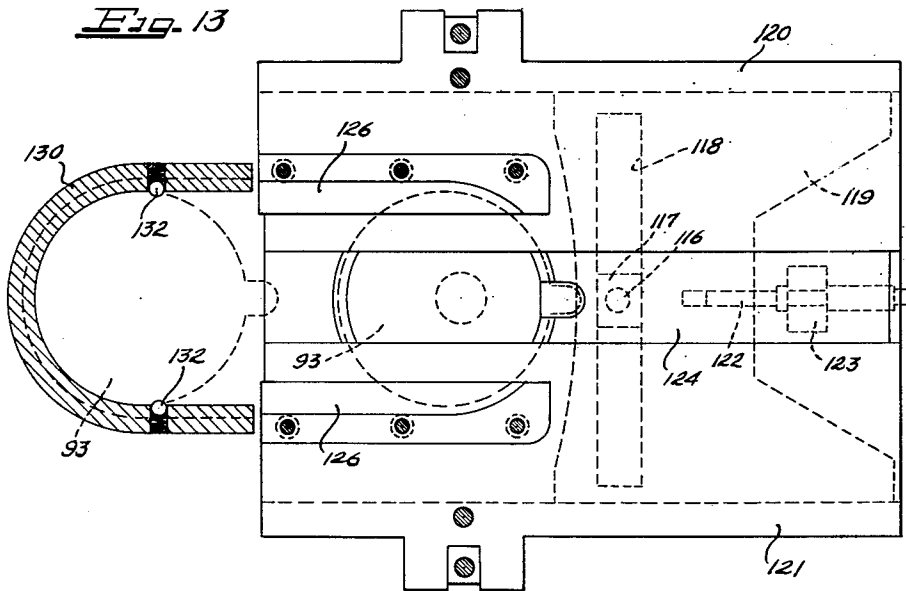
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7 Sheets-Sheet 6



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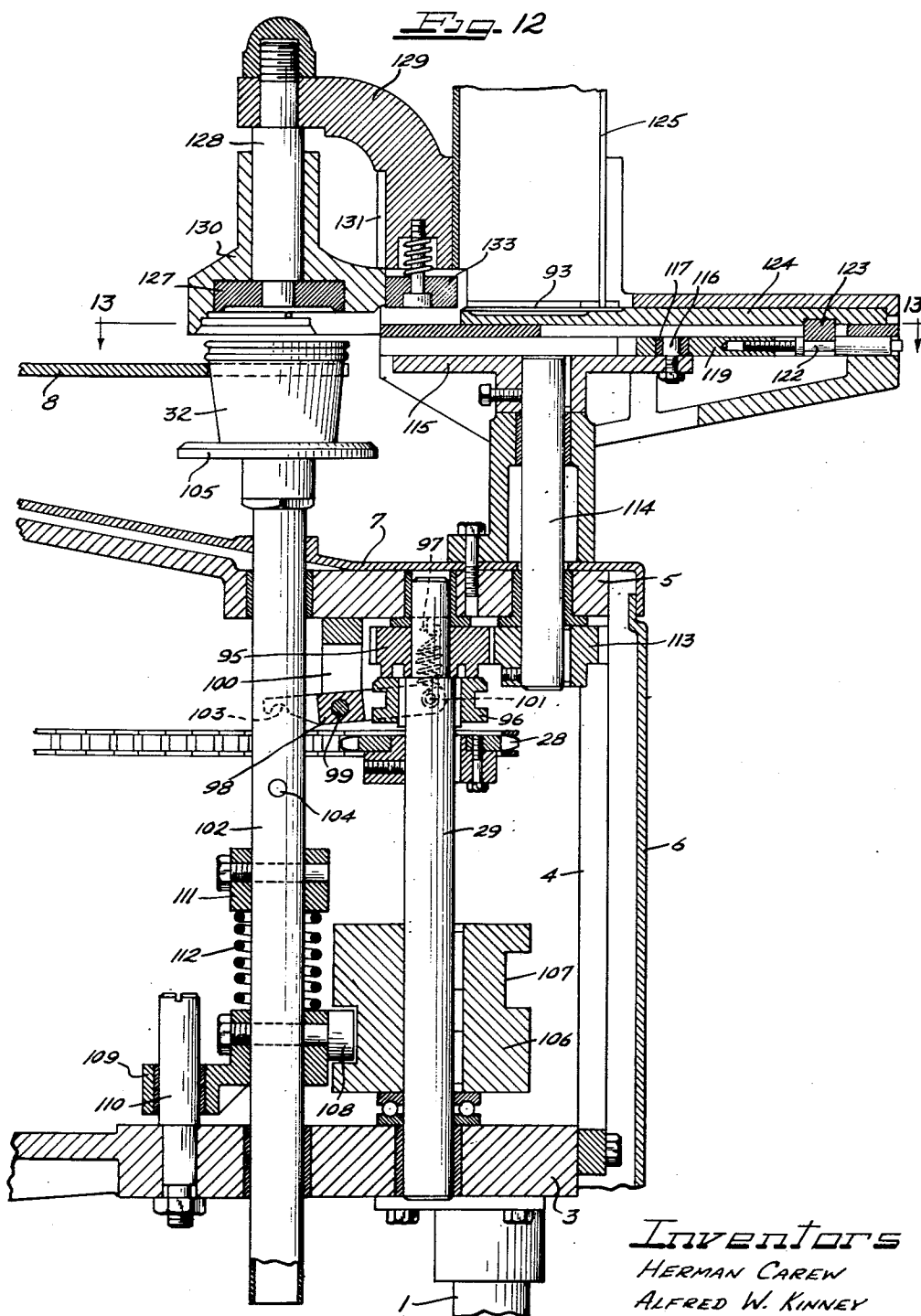
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FILLING MACHINE AND METHOD OF FILLING CONTAINERS

Filed Sept. 4, 1957

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FILLING MACHINE AND METHOD OF
FILLING CONTAINERS

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Filed Sept. 4, 1957, Ser. No. 681,988
16 Claims. (Cl. 53—37)

This invention relates to improvements in a filling machine and method of filling containers, the invention being highly desirable for filling temporary containers with commodities such as ice cream, although the invention may also be utilized with the filling of containers with measured quantities of viscous or semi-solid material such as cheese, butter, and others, all as will be more fully apparent to one skilled in the art.

While the instant invention is suitable for the handling of various commodities, as aforesaid, it will be herein described by way of example and not by way of limitation in connection with the filling of containers with ice cream, because ice cream is perhaps more difficult to properly handle than other semi-solid commodities.

It may further be mentioned that the instant invention is highly desirable for use along with a continuous source of commodity supply, such as a continuous freezer for ice cream, or a continuous churn for butter.

In the commercial packaging of ice cream and similar semi-solid commodities in so-called "temporary" containers, made of paper, thermoplastic material, or any other suitable substance sufficiently economical to warrant the discarding of the container by the ultimate consumer after the contents have been removed, one common practice that has been followed is to move the ice cream from the freezer to a filling location, to fill containers at that location, cap the containers, and then transfer the filled and capped containers into a so-called "hardening" room where the contents of the container is given the final freeze for shipment or cold storage pending use.

Ice cream, as it leaves the freezer, is an extremely delicate substance to properly handle. When it leaves the freezer, it contains the desired body, texture, and amount of overrun. It also has approximately the desired consistency, which is ultimately attained by permitting a slight expansion to eliminate the pressure then upon the ice cream. Essentially, there is sufficient pressure upon the ice cream to move it out of the freezer, particularly where a continuous freezer is utilized, and the slight expansion occurrent upon the elimination of that pressure will bring the ice cream to the optimum consistency. Obviously, the prime desideratum is to get the ice cream into its containers without change in the above-mentioned characteristics, and extreme difficulty has been experienced in endeavoring to get the ice cream into the individual containers in its original condition, heretofore, and insofar as we know, never accomplished to the extent it can be accomplished by the instant invention.

In the past, where the containers have been filled by hand, the difficulties of packaging the ice cream in its original condition are noticeably multiplied. The use of the hand tool obviously presses out some overrun, and forcing the material into the container under pressure results in the cover popping off when the ice cream expands upon pressure release, and if the ice cream was not forced into the container, entrapped air resulted, and that also caused the cover to pop off upon raising the temperature of the ice cream as occurs when the consumer carries it home. Hand packaging is also too slow to be considered in commercial plants.

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Heretofore, where automatic machinery has been utilized for the commercial packaging of ice cream and similar commodities, those machines have in most instances been objectionably slow in operation. In many cases they were not sufficiently sanitary. In all cases of which we are aware, some form of pressure, piston or otherwise, was used to transfer the ice cream from a tank at the filling station and force it into a temporary container. Such procedure by virtue of the pressure altered the characteristics of the ice cream and was highly objectionable to the manufacturer by virtue of the fact that less containers could be filled from a given volume of ice cream owing to the pressing out of some of the overrun, whereby manufacturing cost was greatly increased. In addition, it may be mentioned that piston machines operate much more satisfactorily with sloppy ice cream, and were practically incapable of handling the desired high quality stiff ice cream. Further, piston machines, in effect, massaged the ice cream thereby changing its body and also causing surface melting which resulted in a sandy texture when the ice cream was treated in the hardening room. These formerly known machines, obviously therefore, if they did not alter the consistency, overrun, body and texture of the ice cream, did alter a plurality of them to an objectionable extent. These machines also in most cases delivered the commodity into the container under pressure, so that later the container cover would pop off due to expansion of the ice cream when that pressure was removed. In some instances, these formerly known machines also permitted air to be entrapped in the container beneath the cover, resulting in a popping off of the cover when the temperature was raised.

With the foregoing in mind, it is an important object of the instant invention to provide an automatic filling machine capable of filling containers with ice cream in which the overrun, body, texture, and consistency remain the same as produced in the freezer, with the slight exception of an improvement in consistency by virtue of the release of freezer pressure.

Another object of the instant invention is the provision of an automatic filling machine so arranged as to provide a continuous flow of ice cream or an equivalent commodity directly from the freezer or other source of supply into the containers to be filled.

Also an object of the invention is the provision of an automatic filling machine capable of handling stiff ice cream of dry mixture, as is found in the best grades of ice cream, and maintain the characteristics of that ice cream as developed by the freezer in the slugs deposited in the containers.

Also a feature of the instant invention is the provision of an automatic container filling machine for handling cold semi-solid commodities, and wherein the machine eliminates even the relatively light positive pressure from an ice cream freezer or other source of the commodity, which is essential with automatic freezers and the like, and delivers the commodity into individual containers under no pressure other than atmospheric.

A further feature of the instant invention resides in the provision of an automatic container filling machine which delivers measured quantities of a semi-solid commodity into individual containers by the force of gravity.

It is a further feature of the instant invention to provide an automatic container filling machine capable of handling ice cream and similar semi-solid commodities, the machine maintaining a consistent or continuous flow directly from the commodity source to the container into which a measured quantity is delivered by the force of gravity only.

This invention also seeks the provision of an automatic

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container filling machine that operates much faster than machines of this character heretofore known.

A further desideratum of the invention is the provision of an automatic container filling machine handling food products and which is so constructed and arranged as to maintain sanitary conditions to a more than required degree.

Still a further object of the instant invention is the provision of an automatic container filling machine capable of successively filling containers with a commodity such as ice cream for example, in such a manner that the container cap will not loosen or pop off either due to pressure release and expansion of the commodity in the container, or by virtue of air being entrapped in the container.

It is also an object of the invention to provide an automatic container filling machine embodying dispensing means, filling means, and capping means along with conveying means for successively moving containers through the various stations of the machine, the conveying, dispensing and capping means being driven from a suitable source of power while the filling means are continuous in operation and not responsive to the said source of power.

Still a further object of the instant invention resides in the provision of a new and novel method of automatically filling containers.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a view in elevation, with parts broken away, of an automatic filling machine embodying principles of the instant invention;

FIG. 2 is a top plan view, enlarged, of the structure of FIG. 1;

FIG. 3 is an enlarged vertical sectional view taken substantially as indicated by the line 3—3 of FIG. 1, looking in the direction of the arrows, and illustrating the drive mechanism;

FIG. 4 is an enlarged fragmentary vertical sectional view of the dispensing mechanism taken substantially as indicated by the line 4—4 of FIG. 2;

FIG. 5 is a fragmentary part elevational and part vertical sectional view of the filling means, showing the same with an additional inlet conduit;

FIG. 6 is a fragmentary vertical sectional view, enlarged, illustrating the commodity cutting mechanism, and taken substantially as indicated by the line 6—6 of FIG. 2, but beneath the filling tank;

FIG. 7 is a fragmentary vertical sectional view, also of the cutting mechanism, and taken substantially as indicated by the line 7—7 of FIG. 6;

FIG. 8 is a fragmentary enlarged plan view of the cutting elements, showing the same in open position, and taken substantially as indicated by the line 8—8 of FIG. 7;

FIG. 9 is a fragmentary diagrammatic view illustrating an initial step in the actual filling of a container with a measured quantity of commodity;

FIG. 10 is a view similar in character to FIG. 9, illustrating a still further step in the filling operation;

FIG. 11 is also a diagrammatic view illustrating the application of a cap to the container;

FIG. 12 is an enlarged fragmentary vertical sectional view of the capping mechanism, taken substantially as indicated by the line 12—12 of FIG. 2; and

FIG. 13 is a plan sectional view of the capping mechanism taken substantially as indicated by the line 13—13 of FIG. 12.

As shown in the drawings:

As stated above, the illustrated embodiment of the instant invention will be herein described in connection with the filling of containers with ice cream, by way of

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example, it being obvious that if the instant invention properly handles a substance as delicate as ice cream and preserves its characteristics, the invention will also be useful in the handling of other and less delicate substances or commodities.

Also, by way of example, the instant invention is shown as filling flat bottomed temporary containers, which may be made of paper, waxed or provided with a plastic lining or similarly treated as may be desired, such containers receiving the commonly known type of wafer cap when filled. These containers come in various sizes for individual servings, pints, quarts, half gallons, etc., and it will be understood that certain parts of the mechanism are sized, or other parts substituted therefor, in keeping with the size of container being filled.

It will be further understood that in the construction of the machine, suitable bearings, journals, supports, and the like will be utilized wherever deemed necessary in order to provide rapid, smooth, and accurate operation. Therefore, wherever these parts are provided in a known manner, they will not be specifically referred to herein in the general description of the machine.

The machine in general

The illustrated embodiment of the instant invention is in the form of a portable or easily movable device that can readily be transferred from one location to another as desired, and therefore need not be installed as a fixture in the building.

The machine is preferably supported by a plurality of legs 1, each of which carries a roller or caster 2 at its lower end, and the upper ends of the legs are secured in any desired manner to a base platform 3 (FIG. 12). Suitable frame means 4 are provided to support an upper platform 5 on the base platform, and the structure is enclosed within a housing or casing 6 provided with a cover 7 of similar material, stainless steel being highly desirable.

Now with reference more particularly to FIGS. 1 and 2, it will be seen that above the casing cover 7 the machine is provided with a turntable 8 having spaced container-receiving recesses or pockets 9 adjacent the periphery thereof, and which is mounted upon a shaft 10. As more fully explained later, the turntable is intermittently operated to successively receive containers in the pockets 9 from a container-dispensing mechanism generally indicated by numeral 11, and then successively move each container by a filling station whereat filling means generally indicated by numeral 12 place a measured amount of commodity in each container, and then carry the containers to a capping station where capping means generally indicated by numeral 13 place a cover on the filled containers. As each container is carried beyond the capping means 13, the bottom thereof comes in contact with an upwardly inclined track 14 which gradually elevates the container out of its respective pocket 9 and brings it into contact with the side wall of a discharge chute 15 from which the filled containers may be assembled for packing or further treatment.

The machine is continuous in operation, a dispensing mechanism at the first station being operated continuously to successively drop cups in timed sequence, commodity-severing means for cutting off measured quantities of the commodity stream flowing from the filling means 12 are continuously operated, and the capping means are continuously operated at the third station, while the turntable rotates intermittently to successively stop each container at the filling and capping stations.

The dispensing, commodity-cutting, and capping means, as well as the turntable, are all operated preferably from a single source of power such as a variable speed motor 16 (FIG. 1) operating through suitable gear reduction means enclosed in a housing 17 to continuously rotate a vertical drive shaft 18. Obviously, the motor is provided with the usual controls, not shown.

The commodity such as ice cream emanates in a con-

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tinuous flowing stream from the filling means, and the driven parts of the machine operate in timed relationship to that flow of commodity, so that a container is dispensed while a preceding container is in position to receive a severed slug from the commodity stream, and then is moved on in time for the following container to receive the next slug from the flowing commodity stream, the entire operation being continuous.

The main driving mechanism

The general drive means for the machine is best seen in FIG. 3 of the drawings. Keyed to the drive shaft 18 is an arm 19 carrying a roller 20 on its free end which successively engages in the notches of a Geneva wheel 21 which is affixed to the shaft 10 supporting the aforesaid turntable 9. Thus, the Geneva wheel and consequently the turntable is rotated intermittently a predetermined amount.

A single chain 22 is sufficient to enable all the continuous operating parts of the machine to be driven from the drive shaft 18. In the direction of its travel, as indicated by the arrows in FIG. 3, the chain is trained over a sprocket 23 keyed to the drive shaft 18, and thence around a sprocket 24 that runs freely on the shaft 10 below the Geneva wheel 21. From there, the chain is trained around a sprocket 25 keyed to an upright drive shaft 26 for the dispensing mechanism 11. The chain then passes over an idler sprocket 27 which may be adjustably mounted if so desired so as to vary the tension on the chain when necessary, and is then trained around a sprocket 28 keyed to the drive shaft 29 for the capping mechanism 13. Between the driving sprocket 23 and the just-mentioned sprocket 28, the chain passes over a sprocket 30 keyed to the drive shaft 31 for the cutting mechanism located adjacent the filling means 12.

The use of a single chain for actuating the drive shafts for the mechanisms at the different stations not only insures smooth positive action of the respective parts, but also aids greatly in maintaining proper synchronism among those mechanisms.

The container dispensing mechanism

This mechanism is best seen in FIGS. 1 and 4. With reference more particularly to FIG. 4, it will be seen that the dispensing mechanism is designed in the specific illustrated instance to dispense a flat bottom container 32 having an outwardly and upwardly flaring side wall. Near the top thereof, the side wall of the container is provided with an inwardly opening groove formation 33 to form a seat for a wafer type cap or closure. Preferably at the mouth of the container there is a rolled rim bead 34, and this rim bead 34, of course, is of greater circumference than the bead providing the groove 33. The containers are provided in stacked nested relationship.

The dispensing mechanism is best seen in FIGS. 1 and 4. With reference now to FIG. 4, it will be seen that the shaft 26 projects upwardly through the platform 5 and the casing cover 7 and is contained within a cylindrical housing 35 bolted to the platform 5 and which in turn supports a laterally extending casing or housing 36 having an opening therethrough in which is seated a container magazine 37. A stack of nested containers is placed in the magazine 37, and when the dispensing mechanism is actuated, the lowermost container of the stack is dropped through the opening in the casing 36 and falls into one of the pockets 9 in the turntable 8, as illustrated in FIG. 4.

Any suitable form of dispensing mechanism capable of delivering one container at a time may be utilized, but in the illustrated instance the upper end of the shaft 26 is provided with a sprocket 38. Within the casing 36, a plurality of equally spaced feeding worms 39 are provided, each of which may have a helical groove 40 therein. Each worm is mounted on a spindle and at the base of the spindle or beneath the worm itself is a

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sprocket 41. A suitable chain 42 is trained over the drive sprocket 38 and around each of the sprockets 41 on the respective worm spindle, whereby the worms are continuously rotated from the drive shaft 26.

As seen in FIG. 4, the magazine 37 is slotted at the bottom as indicated as 43 so that the rim beads 34 of the containers extend through the slots into engagement with the feeding worms 39. A rim bead 34 will enter into the groove 40 in each worm, and since that groove is helical in character as the worms rotate the particular container is forced downwardly and out of the end of the magazine so that it may fall into a pocket in the turntable. Thus, a container will drop at each predetermined interval, and the turntable is, of course, timed to intermittently move and receive the falling containers in successive pockets.

The container filling mechanism

This mechanism is best seen in FIGS. 1 and 5 of the drawings and there are no drive means whatever connected with the mechanism.

With reference to FIG. 5 particularly, it will be seen that the filling mechanism is carried by a pair of up-standing posts 44—44 and suitable outstanding and vertically spaced brackets 45—45. Referring to the same figure, it will be seen that the filling mechanism includes a cylinder or tank 46 and there is preferably a jacket 47 around the tank to provide an insulating space 48 between the tank and jacket. This space may be either filled with a satisfactory insulating material, or preferably exhausted of air to a sufficient extent to maintain the temperature of the commodity within the tank 46.

Secured to the bottom of the tank and jacket is a ring flange 49, and a ring 50 may be tightly secured to that flange by means of a suitable quick acting clamp ring 51. The ring 50 is notched to receive therein a radial flange 52a on a discharge nozzle 52, and thereby hold the discharge nozzle in fixed position.

In similar manner, a cover 53 for the tank is held in place by a flange equivalent to the flange 49 and a quick acting clamp ring 54 of the same character as the clamp ring 51.

Inlet conduit means are provided through the tank cover. One or more conduits or pipes may be provided for the cover depending upon what the ultimate mixture or commodity emanating into the container may be. If that commodity is one single thing, such as ice cream of a particular flavor, a single inlet conduit 55 may be provided as shown in FIGS. 1 and 2. Should it be desired to provide ice cream in the container of two different flavors, or a combination of ice cream and sherbet, or some other two-phase mixture, two conduits 56 and 57 may be provided as shown in FIG. 5. Likewise, even more conduits may be provided if the mixture in the container is to be of a greater assorted character.

The conduit means 55 or 56—57 all emanate, in the case of ice cream, from a continuous freezer, there being a separate freezer connected with each inlet conduit. Ice cream manufactured in a freezer, and especially a continuous freezer, is forced out of the freezer by pump pressure from within of just sufficient amount to move the ice cream from the freezer and not cause a compression of the ice cream sufficiently to cut down the overrun. If, however, the ice cream must travel a long distance from the freezer through conduit means, even the freezer pressure might have an adverse effect upon the desired characteristics of the ice cream. Therefore, the instant invention is designed to eliminate even the freezer pressure on the ice cream as soon as possible.

This is accomplished by leading the ice cream directly from the freezer into the tank 46. Regardless of the number of conduits leading to the tank 46, the cross-sectional area of the tank is greater than the total cross-sectional area of the conduit means, and preferably three or four times as great. Thus, when the ice cream enters the tank it is permitted to expand slightly and thereafter

there is no pressure on the ice cream except atmospheric, and even the freezer pressure is eliminated. The slight expansion occurring within the tank 46, if it alters the consistency of the ice cream noticeably, would effect an improvement upon that consistency by eliminating any effect freezer pressure had upon the desired consistency of the ice cream.

The ice cream gravitates from the tank through the nozzle 52, and the taper of the nozzle does not restrict the flow or add pressure to the ice cream, but merely determines the size of stream flowing out of the tank. As will later appear herein, the diameter of the lower end of the nozzle 52 is preferably the same as the inside diameter at the bottom of the container being filled. Consequently, different nozzles are utilized for different sizes of containers. In order to insure that the nozzle does not add any pressure upon the ice cream or restrict its gravitational flow, except for slight wall friction which is unavoidable, the exit end of the nozzle preferably has a cross-sectional area greater than the total cross-sectional area of the conduit inlet means.

Where a mixture of ice cream and sherbet, or different flavored ice creams or the like is desired, a removable partition 58 is disposed inside the tank 46. This partition will divide the tank into a compartment for each inlet conduit, but the resultant stream flowing out the nozzle 52 will be uniform in character although made up of two or more initially separate substances.

The ice cream or other commodity emanates from the nozzle 52 in a continuously flowing stream, actuated solely by gravity. Means to be later described cut this continuously moving stream into properly sized slugs each of which graduates into a container arriving beneath the falling slug at the proper time by virtue of the movement of the turntable 8. Due to its viscosity and semi-solid condition, the ice cream will not gravitate from the nozzle 52 as rapidly as it would move in a free fall, wherefore there is time to sever a slug which immediately upon severance does fall free from the advancing end of the stream. It will be noted that the nozzle projects without the jacketed tank 46 and is therefore disposed to ambient air temperature. This change in temperature in the nozzle causes an extremely slight temperature rise which will effect a minute surface melting of the ice cream, which is sufficient to insure a smooth even flow.

It is desirable that the stream of ice cream emanating from the nozzle 52 is uniform in character and moves straight so that each severed slug will fall accurately into the container therebeneath. To insure that such is the case, all air is preferably kept out of the tank 46. At the start of an operation, assuming the tank to be empty, a cap or temporary closure is held over the lower end of the nozzle and the ice cream is admitted with the upper clamp ring 54 in open position so that the cover is not airtight. Ice cream is pumped into the cylinder from the freezer, and as the cylinder fills the air will bleed out between the top of the cylinder or tank and the cover. As soon as the tank is completely full, all air is out, and the cover is tightened immediately by the quick acting clamp ring 54. Such filling of the cylinder is terminated at the time the cylinder is full, and the fact that the cylinder is maintained full during operation does not mean that any pressure is placed upon the contents of the tank. Filling the cylinder at the start of operation merely insures that no air is present in the cylinder which might cause the stream to deviate from a straight line outlet flow and thus cause a slug of ice cream to fall haphazardly in a container.

It should also be noted that the structure of the filling means insures complete sanitation of the equipment. The jacket around the tank 46 not only eliminates heat shock on the contents of the tank, but prevents condensation accumulating on the tank and dripping on a container or its contents or over some other part of the mechanism in an unsanitary manner. Without the jacket this

dripping might well occur, since in most cold commodity plants there is extremely high humidity.

It will be apparent, therefore, that the ice cream is discharged from the nozzle 52 directly into successive containers in substantially the same condition as it leaves the freezer. The consistency is not changed except slightly by virtue of the light expansion of the ice cream within the tank 46, the body of the ice cream is not changed, the overrun is not altered at all, and the texture remains the same as developed in the freezer. This, of course, is in direct contrast to previously known filling machines wherein additional pressure is provided in some manner, most frequently by a piston or the like, to force the ice cream out of something into the container. The use of a piston or additional pressure presses out overrun so that less containers are filled from a given quantity of ice cream than should be the case. Also, the action of a piston or additional pressure tends to massage the ice cream causing surface melting which results in a sandy or crystallized texture at least on the surface ice cream when it is completely solidified in the hardening room. Further, such changes in the desired characteristics of the ice cream resulting from the use of additional pressure results in uneven filling of the containers, and also frequently results in the caps of the containers popping off at undesired times by virtue of pressure release on the container contents, or by virtue of expansion of air entrapped in the container when it is capped. Obviously, the instant filling mechanism is capable of handling ice cream relatively stiff and of dry texture, as is found in the best grades of ice cream, as well as softer ice cream, whereas machines requiring added pressure or a piston in order to move the ice cream are frequently unable to handle any but very soft ice cream.

It is clear that the filling mechanism of the instant invention may readily handle other commodities than ice cream, particularly since most other commodities are less delicate and do not require the careful handling required by ice cream.

The commodity cutting mechanism

The mechanism that successively severs equal slugs from the commodity stream flowing out the nozzle 52 is best seen in FIGS. 3, 6, 7 and 8.

The actual cutting elements are carried at the upper ends of a pair of vertically disposed shafts 59 and 60 which are both rotary and reciprocatory. These shafts project above the casing cover 7 through a stabilizing housing 61. The cutting elements themselves embody a pair of knife blades which are movable toward and away from each other, each knife blade passing through substantially one half the commodity stream flowing from the nozzle 52 of the filling mechanism. With reference more particularly to FIG. 8, it will be seen that a bow-shaped frame member 62 is supported on the top of the shaft 59 by means of an integral collar 63 and suitable set screw 64. Set in the arm portion of this frame 62 is a block of insulating material 65 to which an electrical conductive holding element 66 is secured. This holding element 66 by means of a suitable screw or the equivalent supports a knife blade 67 which extends across the bow frame 62. Preferably, the knife blade 67 is an alloy containing nickel and chromium and is of rectangular cross-section, a satisfactory size for ice cream being a blade $\frac{1}{16}$ " wide and approximately .016 inch in thickness. Obviously, the knife blade is electrically conductive and also possesses a relatively high resistance so that when electric current is passed through it, it will become heated. Suitable current for the heating of the knife blade would be a maximum of 10 amperes with a potential of 1.5 volts. The knife blade may be connected in any suitable manner to such a source of electricity, as indicated diagrammatically by the conductor 68.

In similar manner, a bow frame 69 and knife blade 70 is connected to the top of the shaft 60. As the knife blades are viewed in FIGS. 6 and 7, they are substantial-

ly in top position at the completion of a cutting stroke; while as the same blades are viewed in FIG. 8, they are in lowermost position and fully separated.

During a cutting operation, the shafts 59 and 60 are moved upwardly and rotated in opposite directions sufficiently to bring the knife blades 67 and 70 substantially together just beneath the nozzle 52 of the filling means, to the position seen in FIGS. 6 and 7. The shafts 59 and 60 are then moved downwardly and rotated sufficiently to separate the knife blades to the position seen in FIG. 8 so that the knife blades may again rise to cutting position without interfering with the flowing stream of commodity.

The reciprocatory movement of the shafts is accomplished by way of a barrel cam 71 (FIG. 6) keyed to the cutting mechanism drive shaft 31. This barrel cam has approximately a helical groove 72 therein which receives a roller 73 carried on a stub shaft 74 mounted in a cross arm 75 connected to the lower ends of the shafts. Referring to FIG. 7, the outer ends of the cross arm 75 are bifurcated to ride along vertically disposed shafts 76 and 77 for added stabilizing reasons. In order to provide sufficient rotation of the cutter shafts 59 and 60 while they are reciprocating for closing and separating the knives 67 and 70, these shafts are provided at their base with elongated gears 78 and 79 respectively as seen in FIGS. 6 and 7. The gears 78 and 79 are in mesh with each other, while the gear 78 also meshes with a gear 80 on the shaft 76, and the gear 79 meshes with a gear 81 on the shaft 77. With reference now to FIGS. 3 and 7, it will be seen that a crank arm 82 fixedly connected to the shaft 77 carries a cam rider in the form of a roller 83 which engages the edge of a cam 84 underneath the aforesaid barrel cam 71 and secured thereto as indicated at 85 in FIG. 6. A spring 87 anchored to the lower platform 3 at one end and to the arm 82 at the other end maintains the roller 83 in contact with the cam 84. Another spring 88 anchored at one end to the platform 3 and at the other end to a crank arm on the shaft 76 tends to assist rotation of that shaft in the direction for a cutting stroke.

In operation, this mechanism is extremely simple and positive. As viewed in FIG. 3, the cam 84 rotates counterclockwise. This cam has a curvate and rather abrupt face 89 which has just passed under the follower 83 and moved the lever 82 outwardly, causing the gear 81 to rotate the two elongated gears 78 and 79 on the shafts 59 and 60 to spread the cutting knives apart to the position seen in FIG. 8. This action is of course against the action of the springs 87 and 88, and during the spread of the knives the shafts 59 and 60 will be elevated, and then the follower will ride down a very abrupt face 90 which results in a quick cutting stroke by bringing the knife blades together very rapidly, assisted by the springs 87 and 88. It appears as though the gear 80 contributes nothing to the rotation of the shafts 59 and 60, but it performs a useful function in that it maintains the spring pressure constant and steadies the operation. The use of both springs 87 and 88 results in the elimination of backlash, eliminates any torsional effect or movement in the shafts, and insures a quick accurate cut with the knives moving uniformly.

In FIGS. 9, 10 and 11, we have diagrammatically illustrated the operation of the cutting means and the method of filling a container with a slug of ice cream or other commodity. FIGS. 9 and 10 diagrammatically disclose a stream of ice cream or commodity 91 exiting from the nozzle 52 of the filling means. The outward flow, as stated above, is by gravity alone and is continuous. It is preferable to have the knives 67 and 70 and the operating mechanism therefor so set that when the knives approach each other to approximately within $\frac{1}{32}$ inch, the knives start downwardly. At that particular point, the severed slug 92 of ice cream may break away and start its free fall, although the knives do ultimately move together.

The stream 91 emanates from the nozzle 52 slower than the slug 92 moves in free gravitational fall. Consequently, the knives in their downward movement, as illustrated diagrammatically in FIG. 10 must move faster than the flow of the stream 91, and yet move slower than the free falling slug 92. As seen in this figure, the knives are ahead of the stream 91 in downward movement, and have already begun to separate for their upward movement. When the knives separate, they naturally must be above the slug 92 or they would spatter ice cream upon their sudden separation.

It is to be especially noted, therefore, that the severed slug 92 is delivered into the container by gravity only and under no added pressure, and this slug possesses all the desired characteristics of the ice cream as created in the freezer itself. When a container cover in the form of a wafer cap 93 is applied to the container by means to be later described, this cover first contacts the slug 92 which is of sufficient height to project slightly above the top of the container. When the cap is pressed into position in the groove 33 of the container, the slug of ice cream 92 is displaced sideways against the walls of the container. As stated above, the diameter of the slug is preferably the same as the inside diameter of the container bottom, and as the ice cream is displaced to the wall of the container, all air will leave the container through the space between the cylindrical slug and the sloping container wall, the slug being of the proper size to just fill the container to the groove 33. Consequently, with such filling of the container, there is no danger of the cap ever popping off because of release of pressure on the contents of the container, because there never was any such pressure, or because of the expansion of entrapped air, because there is no entrapped air. Consequently, the container is filled properly with ice cream possessing all its original desirable characteristics, which was impossible by mechanism known heretofore.

It should also be noted that during the movement of the ice cream from the freezer to the ultimate container, the ice cream passes through only smooth and clean conduit means and over smooth and clean surfaces, so that much more than required sanitation is had.

Referring again to FIG. 6 of the drawings, it will be seen that an aperture is provided in the casing cover 7 directly beneath the filling station and lined with a tube 94 which extends entirely through the casing 6. In the event no container is available to receive a slug of ice cream, that slug may drop through the tube 94 in any suitable receptacle, and will not be splattered over the upper surface of the machine. Such precaution is made because of the fact that the feeding of the ice cream from the nozzle 52 is continuous once the freezer is permitted to discharge ice cream and is not in any manner dependent upon the drive means or the operation of the other mechanisms, including the cutting mechanism. That very free flow of the ice cream insures the packaging of the ice cream with all of its original characteristics intact.

The container capping mechanism

This mechanism is best seen in FIGS. 12 and 13 of the drawings. The mechanism operates upon the premise that if no container is present, no cap is delivered. Thus, jamming of the capping mechanism is avoided.

As is stated hereinabove this mechanism is actuated from the continuously rotating drive shaft 29. On a reduced upper end portion of this same shaft 29, a combined clutch member and gear 95 is floatingly mounted and engageable under normal conditions by a clutch member 96 having an annular groove therein, and which is splined to the shaft 29. A suitable spring 97 normally urges the clutch 96 into engagement with the gear 95 to drive the latter. However, a double armed trip lever 98

is pivoted at 99 to a bracket 100. The inner arms of the trip lever each carry a pin 101 riding in the groove of the clutch member 96, and the outer arms of the member on the other side of the pivot straddle shaft 102 and are each provided with a notch 103 which under certain conditions of operation will be engaged by a cross pin 104 extending through the shaft 102.

This shaft 102 merely reciprocates in the vertical direction and does not rotate. At its upper end it carries a platform 105 for engaging the bottom of a filled container carried in the turntable 8 to elevate that container into position to receive a cap. Keyed to the lower portion of the continuously rotating shaft 29 is a barrel cam 106 having a cam groove 107 therein to receive a follower in the form of a roller 108 carried in a bracket 109, which bracket slides freely on the shaft or post 102 and also on a stabilizing post 110. Between the bracket 109 and a collar 111 fixed to the post 102 is a spring 112 which transmits vertical movement of the bracket to the post 102. In the event the platform 105 contacts the bottom of a container, the pin 104 will not be elevated sufficiently to contact the arms of the trip lever 98, and the container will be provided with a cap. However, if there is no container in the respective socket of the turntable 8, the spring 112 will urge the post 102 to a higher position when the pin 104 will contact the arms of the trip lever 98 and disengage the clutch 96 from the gear 95, thereby preventing operation of the cover or cap delivery means now about to be described.

The gear 95 meshes with the gear 113 fixed to a rotary shaft 114 carrying on its upper end a disc 115. A stub shaft 116 extends upwardly from the disc within a block 117 disposed in a slot 118 in a slide plate 119, operable between opposed guideways 120 and 121. A pin 122 fixed in the slide plate 119 carries a block 123 seated in a suitable recess in a cap feeding slide 124, which in its most rearward position extends beneath a cap magazine 125, and the forward end thereof is suitably recessed to receive the cap 93 of the character above described. While, as seen in FIG. 13, the cap feeding slide 124 is relatively narrow, suitable guide elements 126—126 are provided along which the cap is fed from beneath the magazine 125 into a position beneath a capper head 127 fixedly secured to the lower end of a post 128 depending from a bracket 129. Slidable on the post 128 is a bell-like member 130 which has an extended portion guided in a groove 131 in the bracket 129, as seen best in FIG. 12. This bell 130 assumes the position seen in FIG. 12 by gravity. A pair of spring urged lid retaining elements 132—132 are disposed on opposite sides of the bell to lightly maintain the lid or cap 93 in position until the container rises by virtue of the elevation of the post 102, and in rising raises the bell and receives the cap urged into the container by the capper head 127. With reference again to FIG. 12, it will be seen that the lid moved outwardly by the slide 124 passes beneath a spring urged stripper block 133 depending from the bracket 129, which effectively prevents the outward movement of more than one lid or cover at a time. The stripper block is adjustable to accommodate lids of different thicknesses.

The operation of the capping mechanism is relatively simple. Periodically, the post 102 rises and descends, actuated by the continuously moving barrel cam 106. Each time the post rises, it elevates a filled container 32 upwardly to receive a cap temporarily retained by the means 132—132 in the bell member 130. As the post descends, a new cap is moved outwardly beneath the capper head 127 by the slide 124 actuated by the rotary disc 115 on the upper end of shaft 114. In the event there is no container available to receive a cap, the post 102 will rise higher and the cross pin 104 will engage the ends of the trip lever 98 in the notches 103, and declutch the cap moving mechanism, so that the slide 124 will not operate and no second cap will be pushed outwardly into cap-

ping position. In other words, no cap is delivered when no container is present.

The operation of the machine in general

At the start of a filling operation, containers may be placed by hand in all the notches of the turntable 8 between the dispensing mechanism and the filling mechanism. Before the machine itself is started, the cylinder or tank 46 is filled with ice cream from the freezer, or another commodity from its source, in order to exclude all air from the cylinder. When that cylinder is closed airtight, the machine is started. The ice cream or commodity flows continuously, and the dispensing mechanism, cutting mechanism, and capping mechanism operate continuously. The Geneva wheel 21 governing the movement of the turntable 8 is the only part of the structure that operates intermittently. The turntable therefore indexes intermittently in time to receive each container from the continuously operating dispenser, and the cutting means operate in the manner above described to sever properly sized slugs in time for each slug to drop into an empty container. The capping means displace the slug to fill the sloping wall of the container and expel all air from the container at the same time. Should there be no container present at the capping means, a second cap will not be delivered into capping position so there is no danger of jamming the machine at this point. Immediately upon being capped, the turntable carries the filled and capped container up the ramp 14 so that it may slide laterally out of the respective notch 9 of the turntable on to the discharge chute 15.

It will be especially noted that the drive means for the various mechanisms have no effect or bearing whatever upon the continuous flow of commodity out of the nozzle 52. Once the commodity is started, it continues to flow out the nozzle whether the machine is in operation or not. If there is no container available at the time a slug of commodity is severed from the flowing stream, or if the cutting means are not operating, the stream or slug as the case may be will pass down the tube 94 within the housing of the machine.

The operation of the machine, since it must be timed with gravity flow of the commodity from the tank 46, must necessarily be rapid, and the instant machine performs and fills containers much more rapidly than was heretofore possible by machines of the character heretofore known where added pressure was put upon the commodity to move it into a container.

It will further be noted that the machine is extremely sanitary, in that the commodity itself touches nothing but clean surfaces until it drops into a container, the cutting means operate in such a manner as not to splash or throw any of the commodity over the remainder of the machine, no condensate can drip either upon the commodity or within the container or over the surrounding surface, and all mechanical parts which require any form of lubricant are enclosed within the casing 6 and cover 7.

Of particular importance is the fact that every desired characteristic of the ice cream or other commodity remains unchanged, except for a slight improvement in consistency, from the time the commodity leaves the freezer or other source until it is deposited in the container. At the same time, there is no danger of the cap unexpectedly popping off the container at an undesired time by virtue of expansion of the commodity or expansion of air entrapped within the filled and capped container.

Our improved method of handling a commodity and filling a container with a measured quantity of the same is believed sufficiently apparent from the foregoing as to warrant no further description herein.

This application is a continuation-in-part of and supercedes our copending application entitled "Filling Machines," filed October 14, 1953, Serial No. 382,962, now abandoned.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

We claim as our invention:

1. In a semi-solid material filling machine, a cylinder, supply pipe means leading into said cylinder having a less total cross-sectional area than said cylinder, and a discharge nozzle leading from said cylinder of less cross-sectional area than said cylinder but of greater cross-sectional area than said pipe means.

2. In a semi-solid material filling machine, a cylinder, supply pipe means leading into said cylinder having a less total cross-sectional area than said cylinder, and a discharge nozzle leading from said cylinder of less cross-sectional area than said cylinder but of greater cross-sectional area than said pipe means, said cylinder being vertically disposed with said pipe means at the top and said discharge nozzle at the bottom thereof whereby the commodity gravitates from the cylinder.

3. In a semi-solid material filling machine, a cylinder, supply pipe means leading into said cylinder having a less total cross-sectional area than said cylinder, and a discharge nozzle leading from said cylinder of less cross-sectional area than said cylinder but of greater cross-sectional area than said pipe means, said cylinder being vertically disposed with said pipe means at the top and said discharge nozzle at the bottom thereof whereby the commodity gravitates from the cylinder, and cutting means timed to successively sever portions from the moving stream of material below said nozzle.

4. In a filling machine, means for delivering a downward stream of semi-solid material, and heated cutting means movable to sever successive slugs from the leading end of the moving stream, said cutting means making a quick severance and then moving bodily in the direction of the stream but slower than the falling slug.

5. In a container filling machine, gravity discharge filling means to provide a continuous flow of semi-solid commodity from the bottom thereof, and cutting means to successively sever slugs from the stream of commodity, said cutting means severing a slug and then moving bodily downwardly at a speed faster than the commodity flow from the filling means and slower than the severed slug.

6. In a container filling machine, gravity discharge filling means to provide a continuous flow of semi-solid commodity from the bottom thereof, and cutting means to successively sever slugs from the stream of commodity, said cutting means severing a slug and then moving bodily downwardly at a speed faster than the commodity flow from the filling means and slower than the severed slug, said cutting means being heated.

7. In a container filling machine, a tank for a semi-solid commodity, a nozzle at the bottom of said tank through which the commodity gravitates in a continuously flowing stream, and cutting means to successively sever slugs from the moving stream of commodity, said cutting means comprising a pair of cutting elements laterally movable toward and away from each other, and said cutting means being bodily movable downwardly substantially at the end of a cutting movement and while said elements are separating and then in the upward direction for a new cut, the downward speed of said cutting means being faster than the movement of the commodity stream but slower than the fall of the severed slug.

8. In a container filling machine, filling means providing a continuous gravity flow of a semi-solid commodity, conveying means for successively moving containers under the commodity stream, and cutting means to successively sever slugs from the moving commodity stream in time for each slug to drop freely into a container.

9. In a filling machine for containers having outwardly flaring side walls, filling means providing a continuous gravity flow of a semi-solid commodity, conveying means for successively moving containers under the commodity

stream, and cutting means to successively sever slugs from the moving commodity stream in time for each slug to drop freely into a container, the cross-sectional area of each slug being substantially the same as the cross-sectional area of the container bottom.

10. In a container filling machine, filling means providing a continuous gravity flow of a semi-solid commodity, conveying means for successively moving containers under the commodity stream, and cutting means to successively sever slugs from the moving commodity stream in time for each slug to drop into a container, the cross-sectional area of each slug being substantially the same as the cross-sectional area of the container bottom, but each slug being longer than the height of a container, each container increasing gradually in size toward the top, and capping means to force a cap against the exposed part of a slug and press the same to completely fill the container with air escaping along the container wall.

11. In a filling machine for containers having outwardly flaring side walls, a tank for a semi-solid commodity, a nozzle in the bottom of said tank through which the commodity gravitates in a continuous stream, conveying means to successively carry containers beneath the commodity stream, cutting means acting on the moving commodity stream to successively sever slugs therefrom in time for each slug to fall freely into a container, and the diameter of said nozzle being substantially the same as the bottom of a container.

12. The method of filling a container with a semi-solid commodity such as ice cream, including the steps of moving the commodity under a minimum of pressure into a tank of sufficient size for expansion, permitting the commodity to gravitate from the tank in a continuous stream under atmospheric pressure, successively severing slugs from the leading end of the commodity stream below the tank and permitting each slug to drop freely by gravity, and feeding containers beneath the commodity stream in time for each container to catch a slug.

13. The method of filling containers with a semi-solid material, including the steps of feeding the material in a steady and continuous uniform downward stream under a pressure approximating atmospheric, successively severing slugs from the leading end of the stream, and feeding containers successively into position to catch each falling slug.

14. The method of filling containers with a semi-solid material, including the steps of moving the material under a minimum pressure into a tank of sufficient size for pressure release expansion, protecting the material against temperature change while in the tank, allowing the material to gravitate from the tank in a continuous stream, contemporaneously subjecting the exiting material to a temperature rise sufficient to cause a slight surface melting of the material and smooth the flow, cutting off slugs successively from the leading end of the stream, and successively moving containers into position for each container to catch a falling slug.

15. The method of filling containers with ice cream, including the steps of feeding the ice cream to a tank from a continuous freezer and under the discharge pressure of the freezer only, permitting the ice cream to expand slightly within the tank, gravitating the ice cream from the tank without pressure aid, severing slugs from the outflowing stream of ice cream and permitting the slugs to fall by gravity, and feeding containers beneath the stream in time for each container to catch a falling slug.

16. The method of filling a container having an upwardly and outwardly sloping body wall with ice cream, including the steps of dropping a slug of ice cream by gravity alone in an open container after sizing the slug to provide a cross-sectional area the same as the container bottom and a length exceeding the height of the container part to be filled, and then forcing a cap against the slug to press the slug intimately against the sloping container body wall to fill the desired part of the container and ex-

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clude all air through the space initially between the slug
and body wall.

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